Nitrosopumilus maritimus gen. nov., sp. nov., *Nitrosopumilus cobalaminigenes* sp. nov., *Nitrosopumilus oxyclinae* sp. nov., and *Nitrosopumilus ureiphilus* sp. nov., four marine ammonia-oxidizing archaea of the phylum *Thaumarchaeota*

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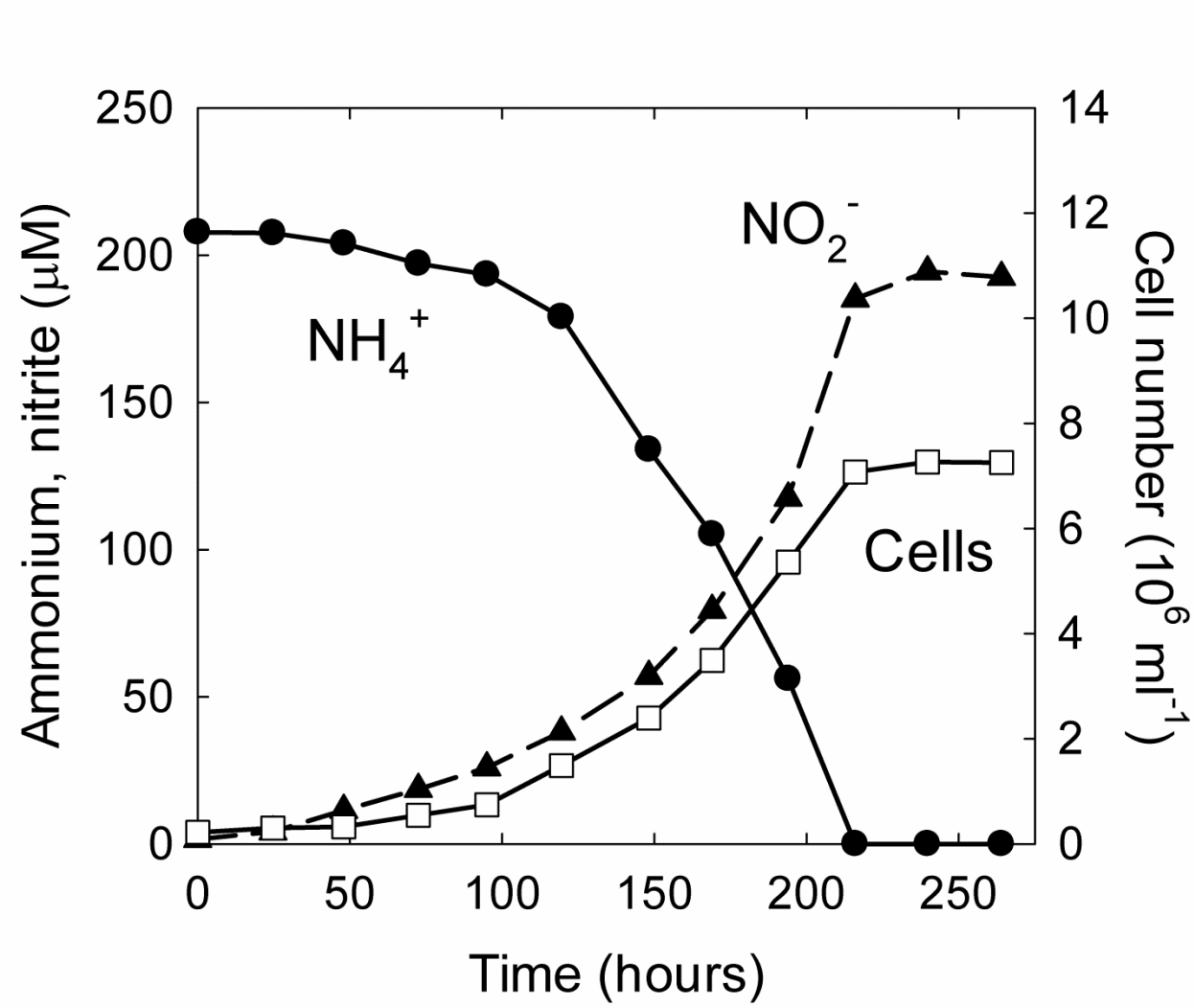

Figure S1. Correlation of the growth of strain HCE1^T with the stoichiometric ammonia oxidation to nitrite. Each data point represents the mean of triplicate cultures.

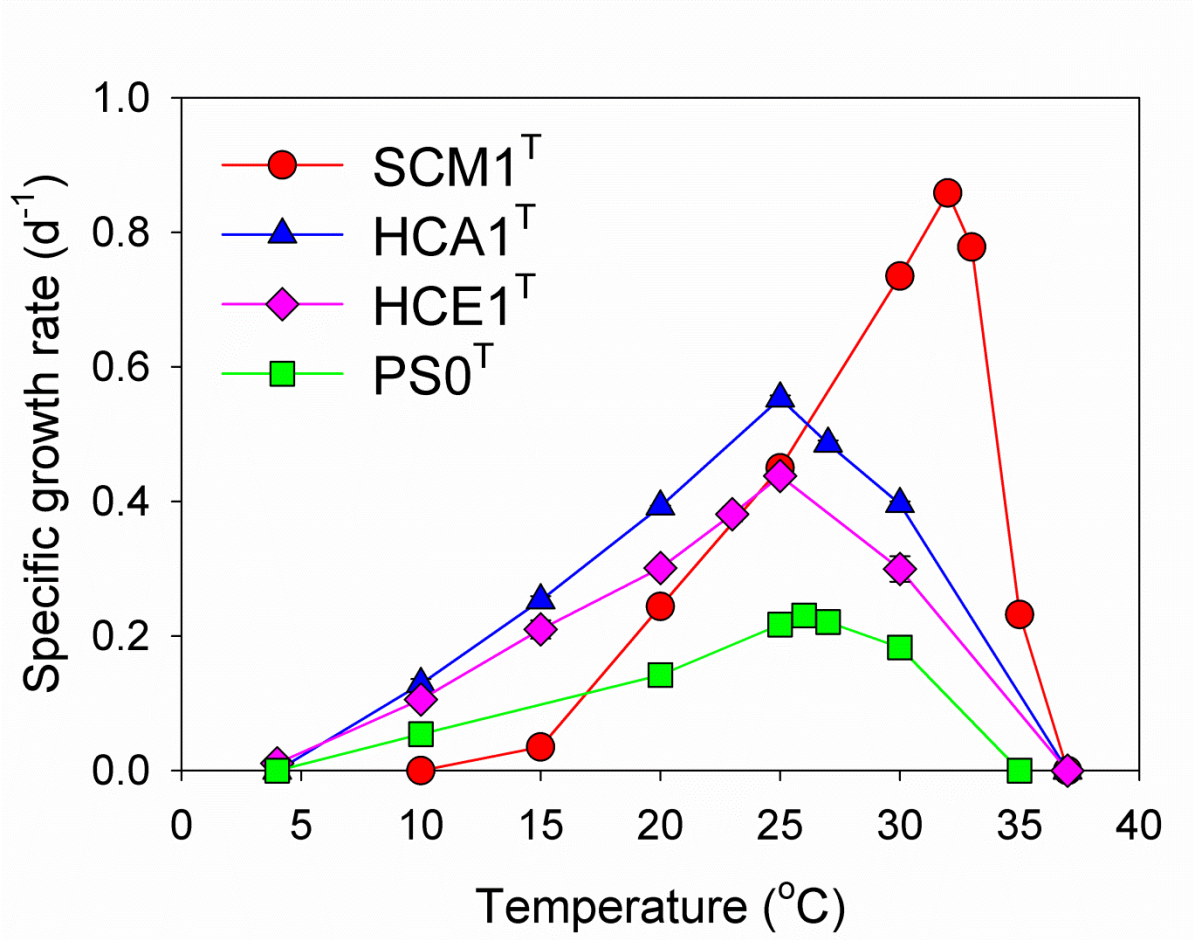

Figure S2. Influence of temperature on specific growth rate. Error bars represent the standard errors of triplicate cultures. Error bars smaller than symbols are not shown.

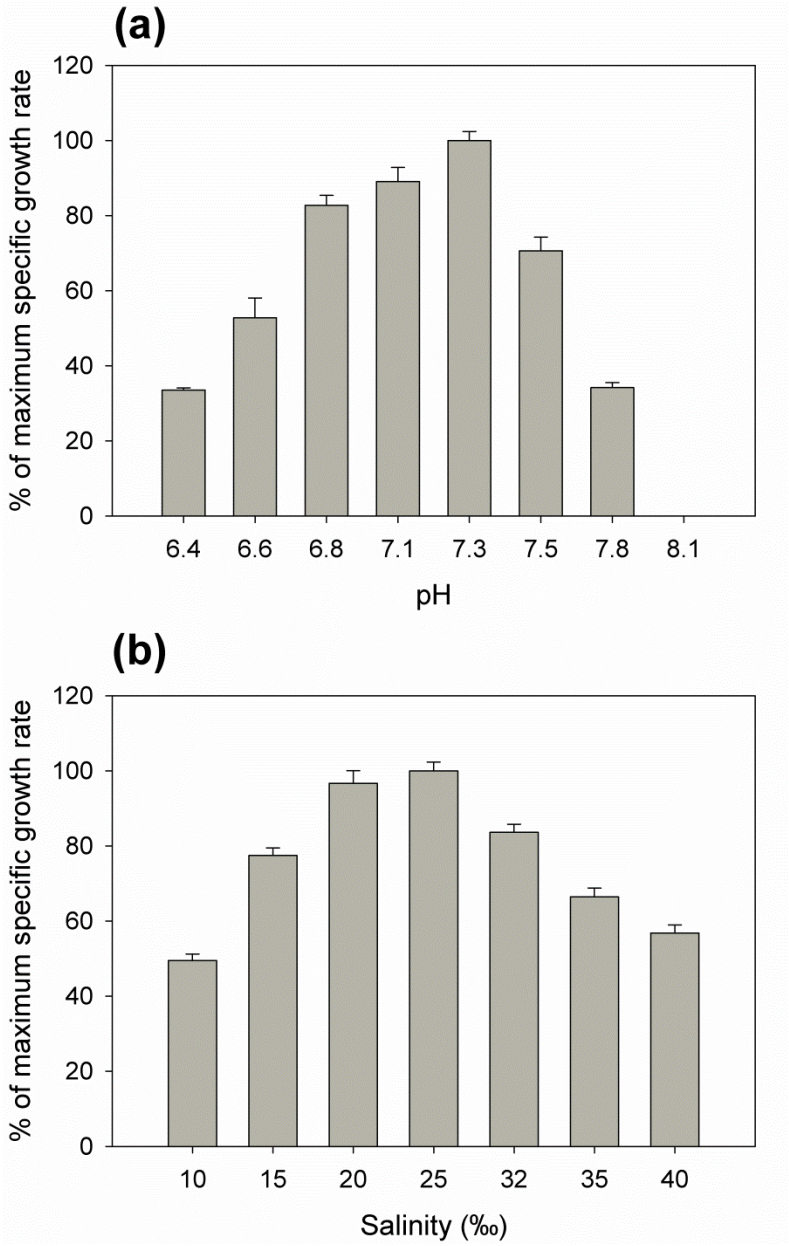

Figure S3. The effect of pH (a) and salinity (b) on the specific growth rate of strain HCE1^{T} expressed as a percentage of those at pH and salinity optima, respectively. Error bars represent the standard errors of the mean of triplicate cultures. Note that no growth was observed at pH 8.1.

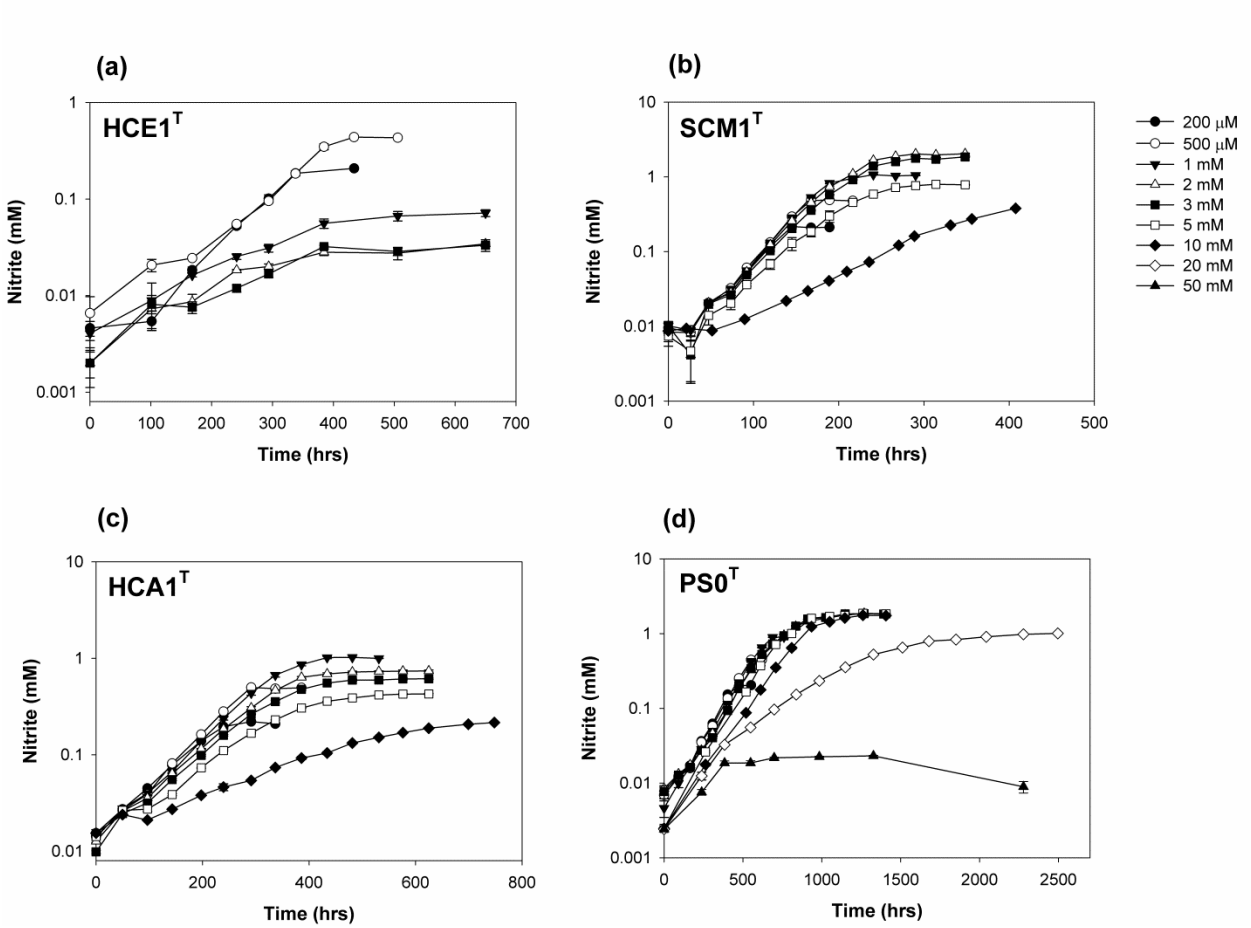

Figure S4. Semi-logarithmic plots of nitrite production vs. time during the incubation of strains HCE1^T (a), SCM1^T (b), HCA1^T (c), and PS0^T (d) at 200 µM–3 mM, 200 µM–10 mM, 200 µM–10 mM, and 200 µM–50 mM initial ammonia concentrations, respectively. Error bars represent the standard errors of the mean of triplicate incubations. Error bars smaller than symbols are not shown.

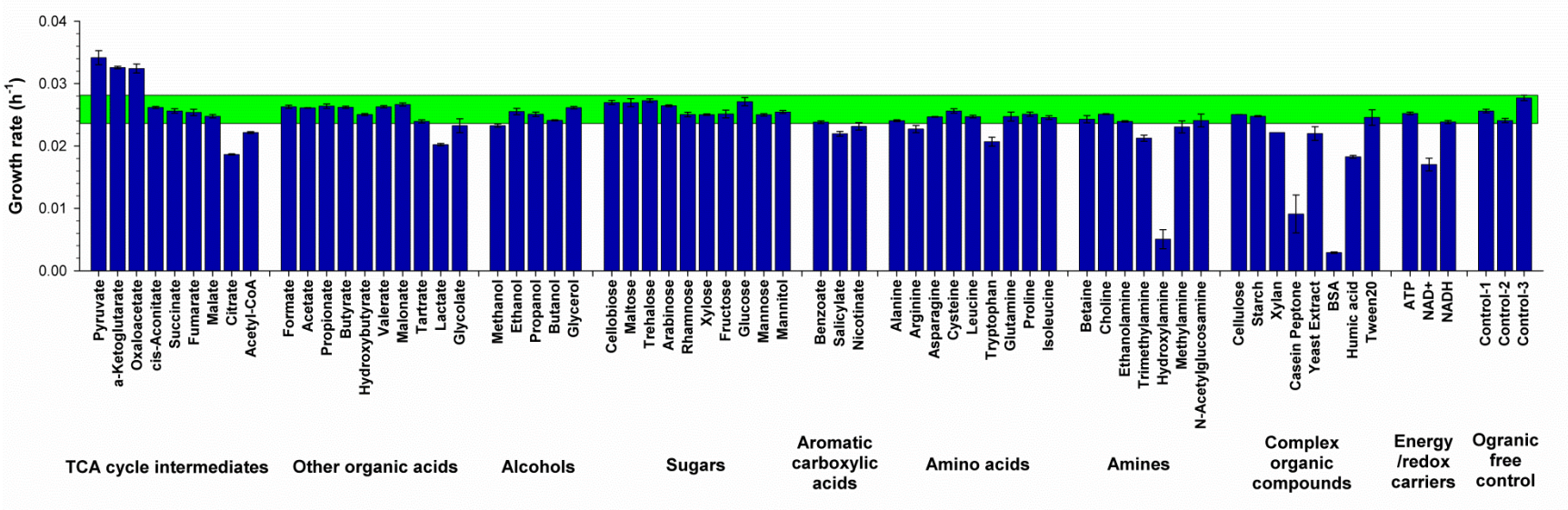

Figure S5. Effect of organic compounds on the specific growth rate of strain SCM1^{T}. All organic compounds were tested at a concentration of 100 μM, with the exception of complex organic compounds at different concentrations (starch: 0.01%, w/v; cellulose, xylan, humic acid, casein peptone, and BSA: 0.005%, w/v; yeast extract: 0.0005%, w/v; polysorbate 20: 0.0001%, w/v). The green shaded area represents the specific growth rate range of controls without organic carbon supplements.

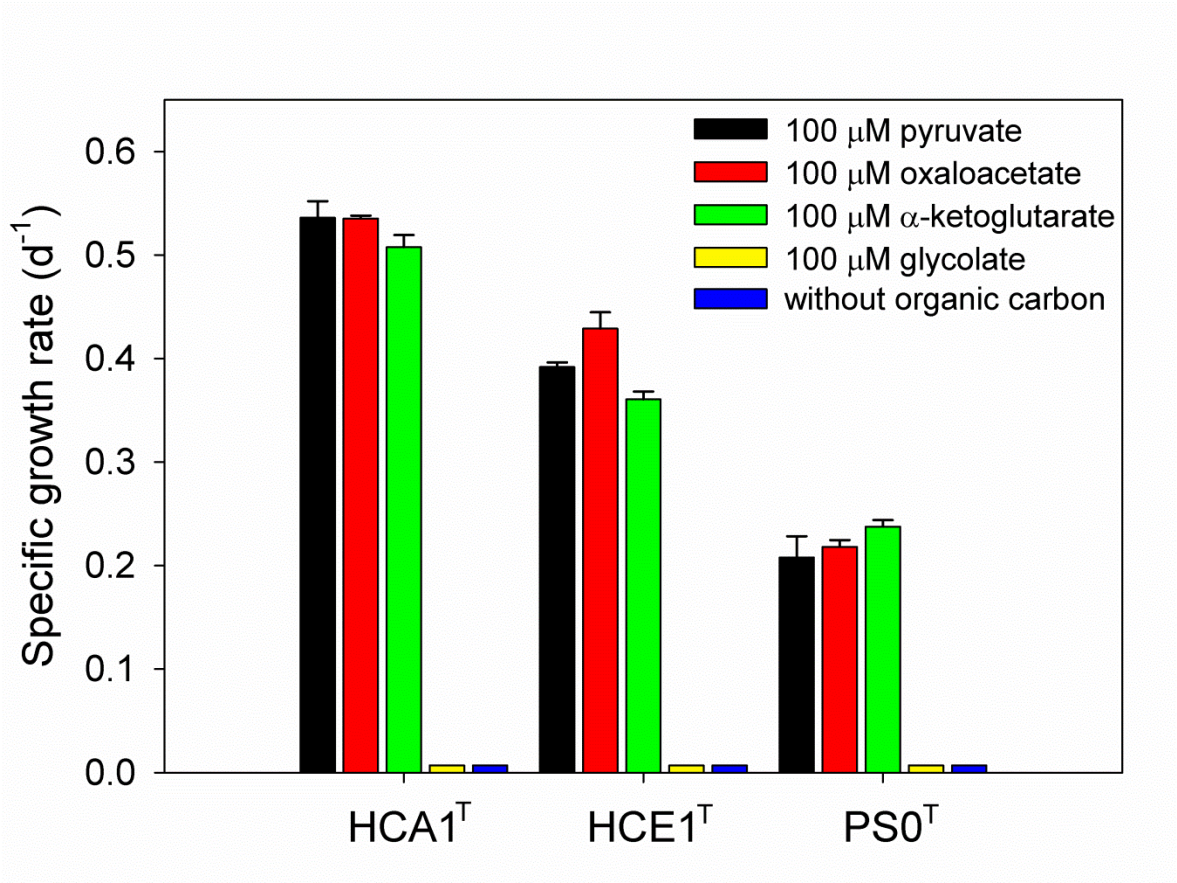

Figure S6. The specific growth rates of strains HCA1^T, HCE1^T, and PS0^T with supplementation of 100 μM pyruvate (black), 100 μM oxaloacetate (red), 100 μM α-ketoglutarate (green), and 100 μM glycolate relative to controls without organic carbon supplements. Error bars represent the standard errors of data from triplicate cultures.

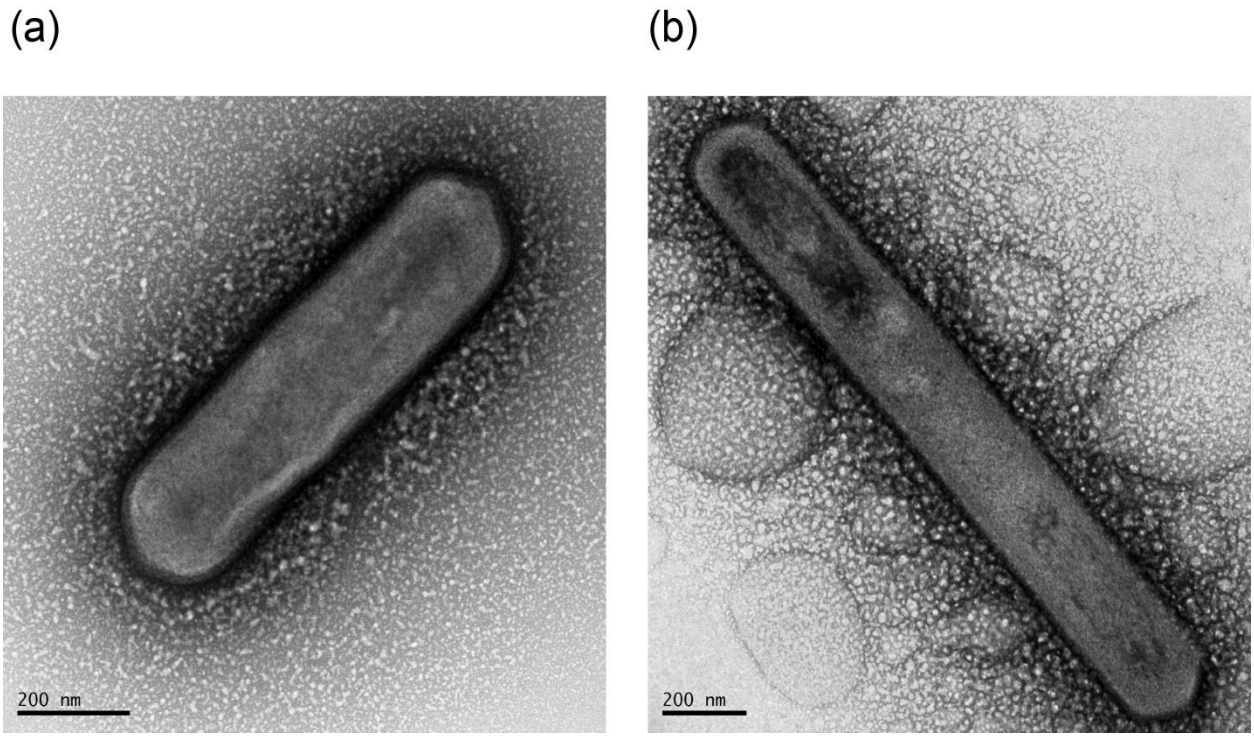

Figure S7. Transmission electron micrographs of negatively stained strain HCE1^{T} cells in its characteristic (a) and elongated (b) forms (Scale bar: 200 nm).

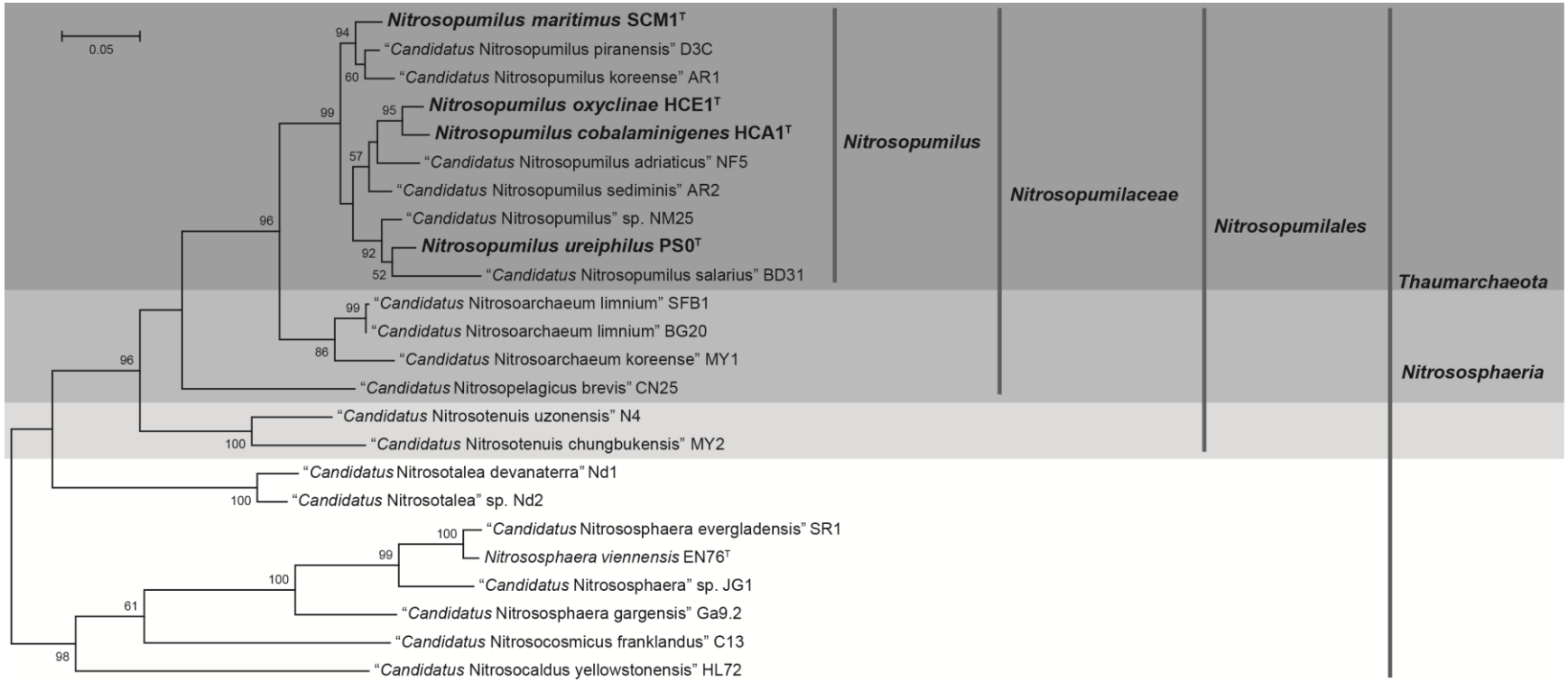

Figure S8. Maximum-likelihood phylogenetic tree based on *amoA* sequences showing the phylogenetic relationships of the genus *Nitrosopumilus*, the family *Nitrosopumilaceae*, and the order *Nitrosopumilales*. Confidence values are based on 500 bootstrap replications. Scale bar represents 0.05 fixed mutations per nucleotide position.